Residential Customer Understanding of Electricity Usage and Billing

A qualitative exploration of residential customers' electricity usage & billing mental models

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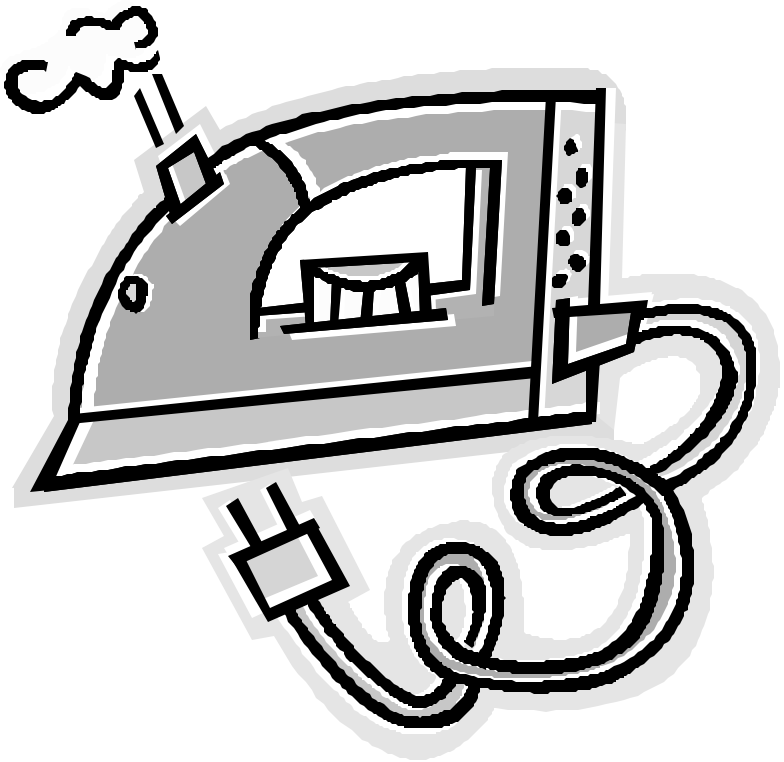
What is a “heuristic” (i.e., Mental Model) and why does it matter?



A heuristic is . . .

- The concept that people have about how something that they can't observe directly actually works

- It doesn't have to be accurate or detailed, as long as it leads to the appropriate outcome

Why do heuristics matter for electricity customers?

- Customer heuristics direct the actions they take
- How do I interpret my electricity pricing/rates & how I'm charged for electricity?
  - I first consult my electricity pricing heuristic
    - How am I charged? When, if at all, do prices differ?
- What do I do to reduce my electricity usage?
  - I first consult my electricity usage heuristic
    - What are my assumptions about what electricity end uses / appliances are the biggest drivers of usage?
- What do I do to reduce my bill?
  - I first consult my electricity billing heuristic
    - How is my electricity usage translated into billed dollar amounts?

- The SPP presumes that customers can appropriately understand and respond to pricing signals that the new pilot rate treatments are intended to send
  - Do their current heuristics allow them to do this?
  - Are there heuristics available that could be useful to them in these contexts?

Current core heuristic for electricity customers

The amount we are billed for electricity is connected to the amount of electricity we use ("the more we use the more we pay") and air conditioning use (for those with AC) is a (even the) primary driver of electricity use

- This is both simple (if not simplistic) and complex
  - Complex given that so many elements of this formula are uncertain when, for other products and services, they are not, with many customers finding it difficult to explain the details.

Complexity of the core electricity billing and usage heuristic

- While on the surface it is similar to heuristics used for other products and services, It is also fundamentally different from these other heuristics in critical ways
  - Most people do not understand the units in which electricity is denominated
  - Most people do not understand how the units of measured use connect to the price
  - Most people do not understand what they get for each unit of cost
    - Lack of understanding of how energy-related actions link to changes in electricity use, or how to predict the specific actions they might take to, for example, reduce their electricity bill by half
- And this has critical implications
  - There is less clarity about electricity usage and billing than for nearly any other product and service
    - This means that, ultimately, everyone ends up having to trust that their bills are “right” since there is no way for them to tell or to determine if the calculation performed is accurate
  - And, therefore greater uncertainty about the consequences of action
    - Most customers cannot tell what impact on usage or the bill a given change in behavior would have

There is variability in the specifics of electricity billing heuristics

- There were specific differences in how the "more I use" was understood to be translated into a bill, with the first two more commonly applied, but most applied to electricity by at least one customer.

- Fixed monthly service fee that includes a baseline / starting usage allotment – any usage over the basic allotment is charged at a fixed price for each additional unit of usage per month
- Variable usage price – price charged per unit (hours, minutes, etc.) goes UP the more the service is used
- Variable usage price – price charged per unit (hours, minutes, etc.) varies by time-of-day / day-of-week service is used
- Average monthly usage fee – based on average usage or the average use of customers in the area per month
- Fixed price for each unit of usage per month
- Monthly fee based on usage – not clear on how this works, or there is no clear connection between usage and total monthly cost for you, but you know the more you use, the more you are charged per month
- Variable usage price – price charged per unit (hours, minutes, etc.) goes DOWN the more the service is used
- Fixed annual fee or cost divided into 12 equal monthly payments
- Fixed monthly fee
- Fixed price for each unit of usage per month plus fixed monthly service fees

Each of these not defined a priori or otherwise specified by the research team – specified by research participants in thinking about how billed for various products and services.

Linking mental models to energy use actions

- While the core heuristic suggests that usage is connected somehow to billed amount, *none of the specific billing structure differences has more specific implications energy reduction actions that would be associated with a reduction in their billed amount.*
- As a starting point, customers are unclear about the specific linkages between changes in energy usage behavior and changes in usage
  - Most have only the most basic notion of which appliances and / or end uses have the greatest impact on electricity use
- Customers assume that significant reductions in energy usage would have to be associated with significant reductions in comfort and convenience
  - This is a result of the underlying logic "what I get in terms of convenience and comfort from using electricity is related to how much I use"
- Customers assume that the "big decisions" have the biggest effect on energy use
  - "Am I going to live in the 21th century or not"
  - Which appliances do I buy?
  - Once these decisions are made, most assume that there is relatively little discretionary usage left to vary and that this discretionary usage is directly related to comfort and convenience

Linking mental models to energy use actions

- However, billing and usage models do not have to be technically accurate in order to be useful or to allow customers to respond appropriately.
  - As an example, many customers reduced their electricity use in California when prices rose after 2001 even though most did not understand the specifics of the tier pricing arrangements under which they purchased electricity.
  - Though clearly, some levels or types of confusion about how pricing plans work, or about how much energy different appliances use, might lead customers to take actions that do not yield the intended reductions in on-peak usage.
- Ultimately, while customers “know” that managing energy usage is the key to managing energy bills, they believe they have relatively few degrees of freedom in usage left to manipulate and little clarity about the exact impact different behavioral changes might yield.
  - Thus, the heuristic in use suggests that once the “big decisions” are made, there is relatively little room, and therefore relatively little reason, to invest time in managing energy.

Implications for perceived control over electricity usage

- Common statements that “I have no control over my electricity usage/bill” need to be understood in context
  - In part, customers mean that they have no control over their provider or the price they are charged
  - In large part, however, they mean that once they establish their “boundary conditions,” they assume that the discretionary usage they could make different decisions about is a small part of their bill
  - And they assume that making significant changes to their discretionary usage would show up in dramatic changes in comfort and convenience
- As a result – saying “I have no control” really means:
  - I can’t select my provider or rate
  - Once I make certain fundamental decisions about how I’m going to use energy, those decisions are not ones I can change on a day-to-day basis
  - If I want to live my life the way I do now, I can’t change the way I use electricity

Billing and usage heuristics for other services

- Most other utility-like services have a fixed price-per-month component, and this is attractive to some/many customers
- Some other services are, at least in part, billed on a usage basis, but in these cases
  - Customers understand the units of usage
  - Customers understand what they “get” for each unit of usage
- Time-based pricing for usage is an easily understandable concept for most customers
  - In fact, discussions suggested that customers may more easily understand time-differentiated pricing (at least the on-peak / off-peak variety) than they understand the notion of inclining block or declining block pricing.
- However, even with other time-based pricing, exact information about hours that define on/off –peak or the exact on-peak vs. off-peak prices is not information most customers have
  - They do know that on-peak prices are “during the daytime” and are “expensive” relative to off-peak prices.
- This suggests that expecting customers to have equivalent information for similar electricity pricing plans is probably unrealistic

Perceived fairness of TD electricity pricing designs

- Customers almost invariably responded to a question about the fairness of a posited pricing design by thinking about its implications for them
  - If they thought the pricing design would yield equal or lower net prices without having to change their behavior, they tended to view it as “fair”
  - If they thought it would end up costing them more, or require them to change their behavior in order to keep their bill even or lower, then it was viewed as punitive and “unfair.” Again, keep in mind that *many felt that changes to their discretionary usage would result in dramatic changes in comfort and convenience.*
- There is also a tendency among some customers to assume that complexity in pricing is a benefit for utilities
  - In that it allows utilities to “game” the system for their benefit in ways that customers cannot monitor
- However, it is worth noting that some customers did view TD pricing as an option that would actually give them *more* control over their bill by giving them the opportunity to shift their usage and save money.
  - Some also indicated that such a plan could be easier to work with than the current inclining block plan since customers do not generally know how much electricity they have used in a month or when the rate goes up to the next level.

Perceived fairness of TD electricity pricing designs

- Nonetheless, the notion of needing to reduce on-peak (summer weekday afternoon) electricity usage in response to TD rates is easy for most customers to understand and, most customers readily accept a rationale for why prices might be higher during the weekday afternoons, regardless of education.

Other Impressions of TD / Variable Pricing

- Some general reactions were also solicited more specifically about critical peak pricing, which were mixed.
  - Many reactions to the idea of critical peak pricing likened this rate option to "pitching in" in a crisis, which was appealing.
  - Others felt it might be easier to respond to since it would only be in effect for a limited number of days per year.
  - Still others felt the rate might be more difficult to deal with because it would be a bit more unpredictable, not occurring everyday.

- While most appeared to readily understand RTP options, the magnitude of pricing variability, on the face of it, would be too much to reasonably deal with (though note that no attempt was made to alleviate customer concerns).

- Regardless of the type of time-differentiated pricing option presented, many still indicated a preference for a flat rate, at least on this initial exposure.
  - Many indicated moving some of their current services to a flat rate pricing plan
  - Many thought a flat rate would simply be easier to deal with / respond to